Lecture 1 Introduction To BIO210

BIO210 Biostatistics

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LIFE SCIENCES

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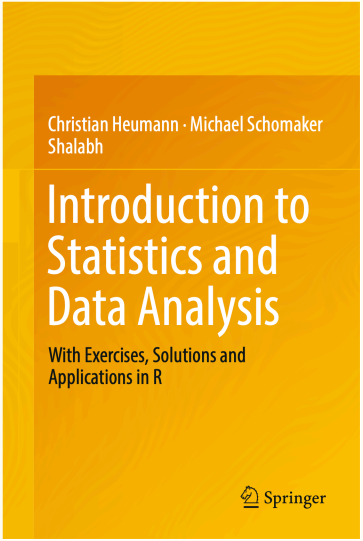
Course material:
https://dbrg77.github.io/SUSTech-BIO210/

Grading system

Attendance	Assignments	Mid-term exam	Final exam
10%	20%	30%	40%

Quizzes and exams: open notes ($\leqslant 5$ A4 papers), calculators can be used !

Textbook



- Available from the library
- 456 pages
- Practical
- Actual codes

Goals of BIO210

- Introduce basic concepts of statistics to students with no prior knowledge
- Feel confident to interpret data/information
- Select appropriate statistical methods for your problem
- Formulate a statistical problem from real-life situation
- Read reference book

Difference to MA212

- Focused on data from basic biology and medicine
- Focused on application
- Focused on statistics

Introduction to biostatistics

- What is statistics?
  - Statistics is the science of getting generalisable knowledge out of a set of data.
  - Statistics is the science whereby inferences are made about specific random phenomena on the basis of relatively limited sample material.

- Why should biologists care about it?

Design of the phone buttons

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Design of the phone buttons

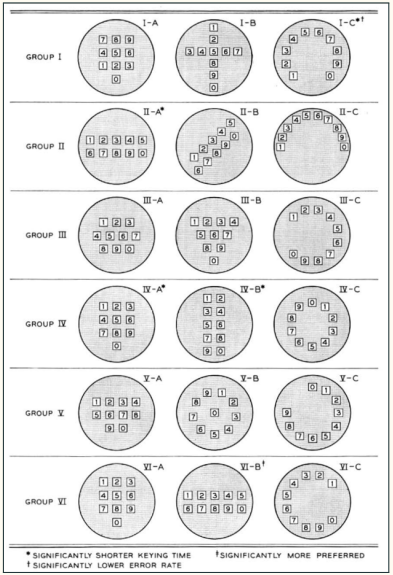
Human Factors Engineering Studies of the Design and Use of Pushbutton Telephone Sets

By R. L. DEININGER

(Manuscript received February 16, 1960)

From the user's point of view, what are the desirable characteristics of pushbuttons for use in 500-type telephone sets? The studies reported bear on this question and also on questions of how people process information when keying telephone numbers. Four categories of design features were studied: key arrangement, force-displacement characteristics, button-top design and central office factors. The results indicate that considerable latitude exists for key set design in terms of user performance; however, the preference judgments are more selective. The studies also showed that the manner in which the person acquired and keyed the telephone number influenced performance appreciably.

Design of the phone buttons



ARRANGEMENT	KEYING TIME (SECONDS)	PER CENT ERRORS	RANKING FOR	RANKING AGAINST
THREE-BY-THREE PLUS ONE	6.01	2.5	3RD	2ND
TWO HORIZONTAL ROWS	6.17	2.3	1ST (MOST)	4TH
TWO VERTICAL COLUMNS	6.12	1.3	5TH (LEAST)	1ST (MOST)
TELEPHONE	5.90	2.0	2ND	5TH (LEAST)
SPEEDOMETER	5.97	3.0	4TH	3RD

Design of the phone buttons

The Journal of Applied Psychology
Vol. 30, No. 1, 1933

Expected Locations of Digits and Letters on Ten-Button Keysets [1]

Mary Champion Lutz
Bell Telephone Laboratories, Murray Hill, New Jersey

and Alphonse Chapanis
The Johns Hopkins University

Although keysets are used on a great variety of machine devices—computers, coding devices, and communications equipment—there appear to be few systematic studies concerned with the design factors that make keysets easy or hard to use. The study reported here deals with one aspect of keyset design, viz., the locations of numbers and letters on individual keys. In addition, we are concerned here with a particular class of keysets —ten-button sets used by long-distance telephone operators—but the results probably can be generalized to other practical situations.

In making long-distance calls, telephone operators use a set of ten keys, arranged in two vertical rows of five, with letters and numbers on the keys as shown in Fig. 1.

To complete a call, the operator usually keys a letter-number combination which looks like this:

815 RE 4-0267

The patterns of errors made by operators suggest that a different arrangement of the letters and numbers on the keys, or of the keys themselves, might help to reduce errors As a first step in the determination of the best arrangement of the keys and of the letters and numbers on them, we decided to find out

FIG. 1 Arrangement of letters and numbers on a toll operator's keyset.

[1] This study was done at the Bell Telephone Laboratories

where people say they would *expect* to find letters and numbers on six different keyset configurations, only one of which resembles the present set (see Fig. 2).

This is not an unusual approach in psychology. There are studies (1, 2) which show that learning is more rapid and errors are fewer for tasks in which the stimuli and required responses are in an "expected" relation than in those where they are not. If people have definite expectancies about the locations of numbers and letters on keysets, this would provide some rationale for the selection of particular keysets to be used in further operational tests.

The specific problem investigated had three parts:

1. Where do people expect to find numbers on each of six configurations of ten keys?

2. Where do people expect to find letters on each of six configurations of ten keys?

3. Where do people expect to find letters on each of six configurations of ten keys, given certain preferred number arrangements already on the keys?

Method

Subjects. The subjects for this experiment were classified according to (a) age, (b) sex, (c) previous experience on keysets such as appear on computing machines, typewriters, and musical instruments. Three hundred Ss were used, one hundred to answer each of the three questions, each one hundred chosen as in Table 1

Test Materials. The test materials consisted of booklets containing circles arranged in each of the six configurations shown in the top row of Fig. 3. Each configuration appeared on a separate page In Part I, a random arrangement of the digits 0 to 9 was printed on the page opposite each configuration of circles In Parts II and III a random arrangement of the alphabet (except the letters Q and Z) was printed on the page opposite each configuration For Part III only the booklets used configurations with numbers already printed in the circles (see Fig 2) The numbering arrangements selected were

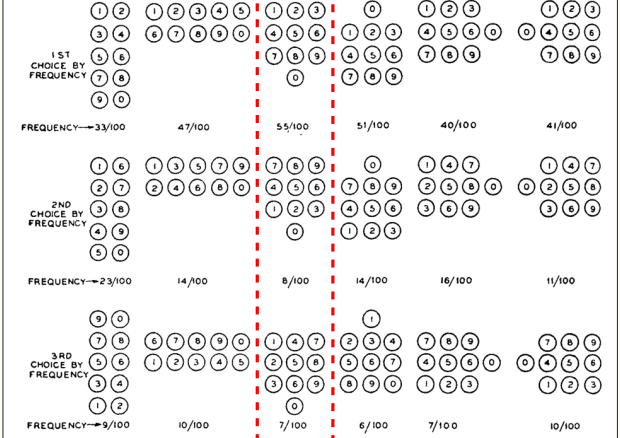
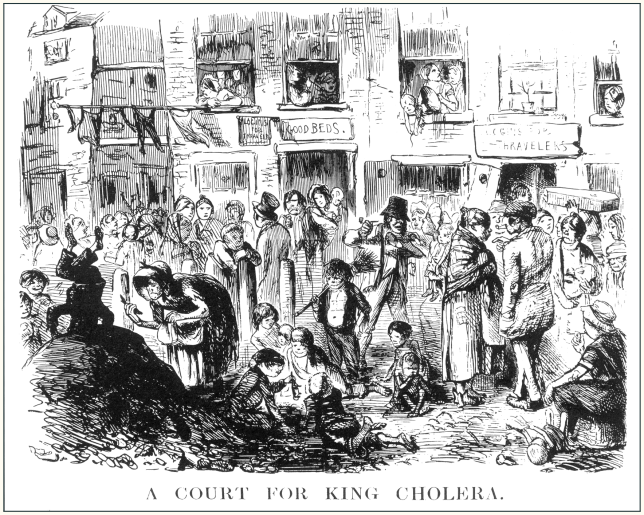


FIG. 3. First three choices by frequency for number arrangements on each of the six configurations tested in Part I

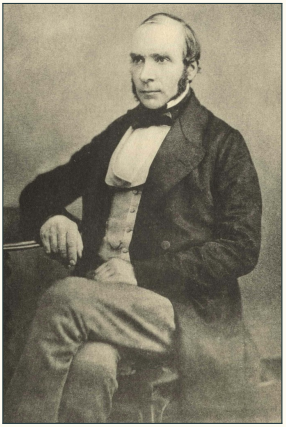
The Cholera outbreak in London, 1854



A COURT FOR KING CHOLERA.

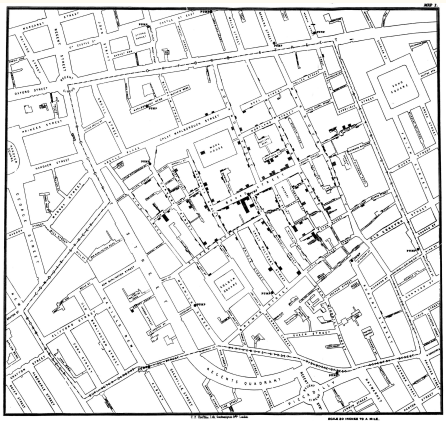
by John Leech (1852) *Punch*

The Cholera outbreak in London, 1854



The Cholera outbreak in London, 1854

The spot map:



http://johnsnow.matrix.msu.edu

https://mjdanielson.github.io/Cholera-Map

The Cholera outbreak in London, 1854

39 Broadwick Street
London

Pfizer Vaccine

Pfizer Vaccine

The NEW ENGLAND JOURNAL of MEDICINE

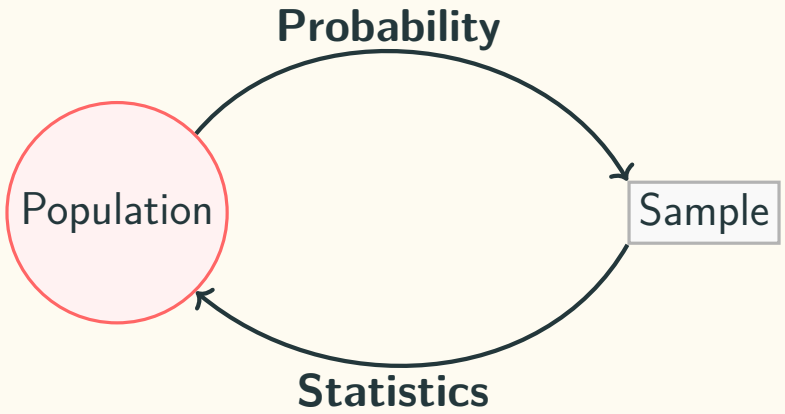
ESTABLISHED IN 1812 DECEMBER 31, 2020 VOL. 383 NO. 27

Safety and Efficacy of the BNT162b2 mRNA Covid-19 Vaccine

Fernando P. Polack, M.D., Stephen J. Thomas, M.D., Nicholas Kitchin, M.D., Judith Absalon, M.D., Alejandra Gurtman, M.D., Stephen Lockhart, D.M., John L. Perez, M.D., Gonzalo Pérez Marc, M.D., Edson D. Moreira, M.D., Cristiano Zerbini, M.D., Ruth Bailey, B.Sc., Kena A. Swanson, Ph.D., Satrajit Roychoudhury, Ph.D., Kenneth Koury, Ph.D., Ping Li, Ph.D., Warren V. Kalina, Ph.D., David Cooper, Ph.D., Robert W. Frenck, Jr., M.D., Laura L. Hammitt, M.D., Özlem Türeci, M.D., Haylene Nell, M.D., Axel Schaefer, M.D., Serhat Ünal, M.D., Dina B. Tresnan, D.V.M., Ph.D., Susan Mather, M.D., Philip R. Dormitzer, M.D., Ph.D., Uğur Şahin, M.D., Kathrin U. Jansen, Ph.D., and William C. Gruber, M.D., for the C4591001 Clinical Trial Group*

Key results: A total of 43,548 participants underwent randomization, of whom 43,448 received injections: 21,720 with BNT162b2 and 21,728 with placebo. There were 8 cases of Covid-19 with onset at least 7 days after the second dose among participants assigned to receive BNT162b2 and 162 cases among those assigned to placebo; BNT162b2 was 95% effective in preventing Covid-19 (95% credible interval, 90.3 to 97.6). Similar vaccine efficacy (generally 90 to 100%) was observed across subgroups defined by age, sex, race, ethnicity, baseline body-mass index, and the presence of coexisting conditions. Among 10 cases of severe Covid-19 with onset after the first dose, 9 occurred in placebo recipients and 1 in a BNT162b2 recipient. The safety profile of BNT162b2 was characterized by short-term, mild-to-moderate pain at the injection site, fatigue, and headache. The incidence of serious adverse events was low and was similar in the vaccine and placebo groups.

Course outline



Probability vs. Statistics

Probability: Previous studies showed that the drug was 80% effective. Then we can anticipate that for a study on 100 patients, in average 80 will be cured and at least 65 will be cured with 99.99% chances.

Statistics: Observe that 78/100 patients were cured. We will be able to conclude that we are 95% confident that for other studies the drug will be effective on between 69.88% and 86.11% of patients.

What is this course NOT about

- Bayesian statistics
- Mathematical proof
- Implementation
- How and where to find data